The wide variety of rules for the proportioning of the regenerators affords an ample opportunity for choice, and in part explains the variation in volume of checkerwork used by different designers. Empirical rules, basing the proportioning of a part by a direct ratio with the capacity of the furnace are very easy to apply, and require very little thought in their use. In addition they save time, as it only takes a few minutes to arrive at the regenerator volume required. Unfortunately, this is not the case when logical methods are employed.

HORIZONTAL OR VERTICAL PASSAGES

Regenerators may be built with the gas passages arranged horizontally or vertically. Where head room is limited a horizontal pass regenerator, at first sight, appears to possess certain advantages, but a consideration of the behavior of heated gases when cooling and of cold gases when being heated, will show that a horizontal regenerator or recuperator introduces a considerable amount of friction in the path of the gases, necessitating an initial pressure for introducing the air and gas and a strong suction to remove the waste gases.

At Steelton, Pa., it was found necessary to use a blower with horizontal regenerators. The writer recently had occasion to investigate the action of some horizontal regenerators. It was found that the products of combustion were flowing mainly through the upper passes and their heat was conveyed to the lower passes by conduction through the brickwork. The air supply flowed through the entire height of the checker. The Motional resistance was excessive. These regenerators, however, contained an enormous weight of brick for the amount of work to be done by them, and for that reason gave very little difficulty in operation.

A basic principle of regenerator design is: the

gas passages should be vertical; the cooling gas should pass downward through the checkerwork; the gas being heated should pass upward through the checkerwork. When the gases circulate in this manner they have a tendency to subdivide themselves between the different passes proportionally to the local heating and cooling of the brick-work, with the result that the cooling and heating of the gases will be practically uniform. A few years ago A. E. Maccoun made a series of temperature observations on a Cowper hot-blast stove at